MASTER OF SCIENCE
IN
ENGINEERING ACOUSTICS

PERFORMANCE OF ACOUSTIC SPREAD SPECTRUM-SIGNALING IN SIMULATED OCEAN CHANNELS

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Direct-Sequence Spread Spectrum (DSSS) modulation is being advanced as the physical-layer basis for Seaweb undersea acoustic networking. DSSS meets the need for channel tolerance, transmission security, and multi-user access. This thesis investigates the performance of subspace-decomposition blind-equalization algorithms as alternatives to RAKE processing of DSSS signals. This approach is tailored for superior performance in time-dispersive and frequency-dispersive channels characteristic of ocean acoustic propagation. Transmitter and receiver structures are implemented in Matlab and evaluated with a statistics-based model of a doubly spread channel with additive noise. Receiver performance is examined using Monte Carlo simulation. Bit-error rates versus signal-to–noise ratio are presented for various multipath assumptions, noise assumptions, and receiver synchronization assumptions.

KEYWORDS: Acoustic Communications, Underwater Communications, Underwater Networks, Undersea Warfare, Statistics-based Channel Modeling, Direct-sequence Spread-spectrum, Blind Equalization, Subspace-decomposition, DSSS, DS-CDMA, Telesonar, Seaweb